

ART VII.—*New or Little-known Fossils in the National Museum. Part XXVIII.—Some Silurian Rugose Corals.*

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(With Plates XII.-XV.)

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Introduction.

During the past few years several new or interesting examples of rugose corals have been acquired, mainly through the generosity of the discoverers, for the Museum collection. These, together with several hitherto obscure generic types in the old Geological Survey collection made by the late Dr. Alfred Selwyn, formed, it was thought, a sufficiently important collection to describe or otherwise elucidate at the present time.

No doubt shortcomings will be found, in the incompleteness of the comparisons made, by specialists elsewhere, but these may be partly excused by the lack of literature, since some of the more essential works on Palaeozoic corals, are apparently not included in any of the Melbourne or even Australian libraries.

It is here interesting to notice the similarity between European and American types of certain rugose corals and those of the Australian forms, and even in some cases the conspecific relationship which can be established.

The confirmation of Nicholson and Etheridge's remarks on the genus *Lindstroemia* is clearly seen in the diagnoses of the Victorian species, which, although so poorly preserved as fossils in the impure limestone, show all the essentials of the internal and external characters of the corallum.

Synopsis of Species.

The following genera and species of rugose corals are here described or discussed:—

Name.	Locality.	Age.
<i>Lindstroemia yeringiae</i> , sp. nov.	Yering District, Upper Yarra; Ruddock's Quarry, Lilydale; nr. Seville, east of Lily- dale.	Silurian (Yeringian)
„ <i>parva</i> , sp. nov.	Yan Yean; Merri Creek, Kalkallo.	Silurian (Melbournian)
„ <i>ampla</i> , sp. nov.	Cemetery Hill Road, Whittlesea.	Silurian

„	<i>conspicua</i> ,	South Yarra; Moonee Ponds Creek.	Silurian (Melbournian)
	sp. nov.	Wandong; Glenburnie Road, Whitilesea.	Silurian
„	<i>scalaris</i> ,	Glenburnie Road, Whitilesea; Wandong.	Silurian
	sp. nov.	Camberwell.	Silurian (Melbournian)
<i>Cyathophyllum</i>	<i>cresswelli</i> , sp. nov.	Cave Hill, Lilydale.	Silurian (Yeringian)
„	<i>subcaespitosum</i> ,	Cave Hill, Lilydale.	Silurian (Yeringian)
	sp. nov.		
<i>Spongophyllum</i>	<i>stevensi</i> ,	Cave Hill, Lilydale.	Silurian
	sp. nov.		
„	<i>shearsbii</i> ,	Hatton's Corner, Yass, N.S.W.	Silurian
	sp. nov.		
„	<i>bipartita</i> ,	Eth. Hatton's Corner, Yass, N.S.W.	Silurian
	fil. sp.		
<i>Columnaria</i>	<i>flemingtonensis</i> , sp. nov.	Moonee Ponds Creek, near Melbourne.	Silurian (Melbournian)

Description of Species.

Sub-class TETRACORALLA.

Fam. CYATHAXONIDAE.

Sub-fam. LINDSTROEMIINAE, Chapman.

(Corals of the Cyathaxonid type, but calices with dissepiments.)

Genus *Lindstroemia*¹, Nicholson and Thomson, 1876.

Observations on the Genus.—In the Proceedings of the Royal Society of Edinburgh for 1876, Vol. IX., No. 95, p. 150, Dr. Alleyne Nicholson and Mr. James Thomson proposed the name *Lindströmia* for a new genus of small Palaeozoic corals “in which the corallum is simple and conical, with an extremely deep calice. The septa are well developed and meet in the centre of the visceral chamber, where they coalesce to a greater or less extent, and form a strong, twisted pseudo-columella, which projects into the floor of the calice, and occupies a large portion of the entire visceral chamber. There are no tabulae, but the septa are furnished with more or less strongly developed dissepiments, which, however, are remote and do not give rise to any vesicular zone. The species *L. columnaris* was described from the Devonian rocks of North America, and it was mentioned that the authors were in possession of other forms of the genus, still undescribed, from the Carboniferous rocks of Scotland.”

This paper was, unfortunately, only published in abstract, so that even the selected genotype, *L. columnaris*, was not described.

Later on, however, in 1880 (“Silurian Fossils of the Girvan District in Ayrshire,” Vol. I., p. 84, Figs. 4*b*, 4*b*¹),” Dr. Nicholson,

1.—This spelling is here adopted with “oe,” as an extension of the modified “o”; cf. *Roemeraster* and *roemeri*.

in conjunction with R. Etheridge, junr., published figures of *Lindstroemia columnaris*, Nich. and Thoms., so that the actual structure of the genotype is known from the drawings. Those authors again refer, at some length, to the characters of *Lindstroemia* as a genus, and passing over the "selected" genotype², they refer to several species as typical of the genus, the first to be enumerated being Lindström's "*Cyathaxonia*" *dalmani* (loc. cit., p. 81).

This form, together with "*Cyathaxonia*" *siluriensis*, McCoy, and one of McCoy's "*Petraia*"—viz., *subduplicata*, and a Girvan species, *L. laevis*, are there described.

Since Nicholson and Etheridge minutely describe the generic characters of *Lindstroemia* in their "Girvan Fossils," characters which are quite comparable with those of some Australian Silurian examples, I have no hesitation in accepting the generic name, although no genotype is there specifically mentioned or even indicated.

Generic Characters of *Lindstroemia*—after Nicholson and Etheridge junr.³

"Corallum simple, conical or turbinate, the epitheca complete, with well-marked longitudinal ridges, fine encircling striae, and low annulations of growth. Septa well developed, lamellar, equally developed or of two sizes, united inferiorly in the axis of the visceral chamber, and augmented by a secondary deposit of sclerenchyma, so as to form a comparatively enormous columella, which projects into the floor of the calice. The lower portion of the visceral chamber often more or less completely filled up by the deposition within it of solid sclerenchyma. Interseptal loculi, usually crossed by a few strong and remote dissepiments; and the upper portion of the visceral chamber not uncommonly traversed by thick transverse plates of the nature of tabulae, though at other times these are not recognisable, or at any rate have not been clearly made out."

As already referred to, Nicholson and Thomson's MS. name of *L. columnaris* has since been figured and briefly described in the explanation to figure given by Nicholson and Etheridge junr., so that the genotype, which, according to Nicholson, one of the authors, still retains that status, remains good, but should now be referred to the authorities, Nicholson and Etheridge junr. This point should not be obscure, since Nicholson and Thomson had already selected a form which was described subsequently.

It may be noticed, in passing, that in the original description based on the still undescribed but figured *L. columnaris*, Nicholson and Thomson state that "There we have no tabulae" (loc.

2.—Cf. "Girvan Fossils," 1880, p. 81.—"The genus *Lindströmia* was founded by one of the present writers and Mr. James Thomson, for the reception of certain small corals from the Devonian formation of North America, the specific description of which is unpublished."

3.—"Girvan Fossils," 1880, p. 80.

cit. 1876, p. 150); this statement is emended by Nicholson and Etheridge junr. (loc. cit., 1880, p. 83), who say, "Upon the whole, however, we think that the presence of ill-developed tabulae may be regarded as the rule in the genus *Lindströmia*."

Note on the Relationship of the Genus *Lindstroemia*.—The genus *Lindstroemia* is now known from beds as old as the Middle Ordovician (Black River Series) of Kentucky, *L. whiteavesi*, Foerste); from the Upper Ordovician and Lower Silurian of Scotland and England (*L. subduplicata*, McCoy sp.); from the Upper Ordovician of Girvan, Scotland (*L. laevis*, Nicholson and Etheridge fil.); from the Upper Silurian of Gotland (*L. dalmani*, Edwards and Haime sp.); and from the Devonian of North America (*L. columnaris*, Nicholson and Thomson).

From *Cyathaxonia*, *Lindstroemia* differs in having a columella derived from the septal elements to which it is connected by dissepiments; whereas in the cyathaxonid type the columella, excepting at the earliest stage, is essential, that is, possessing a distinct character apart from the septal development.⁴

Towards *Zaphrentis* there is a strong affinity, in the case of *Lindstroemia ampla*, in the development of cardinal and counter septa, although no fossula is distinctly seen.

LINDSTROEMIA YERINGAE, sp. nov.

(Plate XII., Figs. 1a-f; Pl. V., Figs. 20, 21.)

Description.—Corallum of moderate size, typically elongate-conical; straight or slightly curved. Exterior showing vertically costate epitheca, the striae having an interseptal relationship. Straightness of sides of corallum somewhat interrupted by growth stages, representing the thickening of the edges of successive calicular borders. The transverse sectional outline of the calice shows this coral to be of somewhat irregular contour, very few examples being truly circular in section. Several examples are almost elliptical, whilst others are slightly compressed at various angles.

A horizontal section across the top of the calice shows a series of 45 short spinose septa, at first sight of about equal length, projecting only about $\frac{1}{5}$ the distance to centre; on closer inspection these septa are seen to be alternately long and short, especially in the earlier part of the calice, where they are short and thick, and longer with spinose ends.

A horizontal section of the calice at circ. 6 mm. from the base shows the septa to extend nearly to the centre, where they meet to form a solid pillar of coenenchyma, in which the partially resorbed septal plates are still visible.

An interesting feature of the septal structure in these examples is brought out in section owing to the peculiar preservation of

4.—Cf. Robinson, W.I. The Relationship of the Tetracoralla to the Hexacoralla. Trans. Connecticut Acad. Arts and Sciences, Vol. XX., 1917, p. 189, et. seq.

the corallum in an impure limestone; the interseptal spaces, coincident with the epithecal costæ, are filled with ochreous mud and in sections appear as true septa, but are merely negative structures.

A vertically and medially sliced specimen (paratype) shows the basal filling of the cup to extend, in this example, for two-thirds the height of the calicular cavity. In another paratype, similarly sliced, definite dissepiments are seen between the wall and the basal columella.

Dimensions of Holotype.—Length of corallum, 27 mm. Width of calice, at 12·5 mm.

Observations.—The nearest related species to the above seems to be "*Petraia*" *subduplicata* of McCoy's⁵, which Nicholson and Etheridge junr. have refigured and placed under *Lindstroemia*⁶. In McCoy's species, however, the corallum is often shorter, and it is broader at the distal and more acuminate at the proximal, whilst the columella is more massive. The epithecal striae are finer than in *L. subduplicata*.

L. subduplicata is a Caradocian (Upper Ordovician) and Upper Llandovery (Older Silurian) fossil in Ayrshire (Scotland), and Denbighshire (Wales).

Occurrence.—From the Silurian (Yeringian) mudstones and impure limestone of the Yering District, Upper Yarra (G. S. V. coll.). Also Ruddock's Quarry, Lilydale (coll. F. C.); and near Seville, east of Lilydale (coll. F. C.).

LINDSTROEMIA PARVA, sp. nov.

(Plate XII., Figs. 2, 3.)

Description.—Corallum small, elongate-cylindrical to short conical, with a slight curvature. Septa about 15 to 20. Epithecæ strongly striated and apparently slightly spiny. Growth stages or rejuvenescent periods well marked. Columella evidently short.

Dimensions.—Length of Holotype, 9·5 mm. Width at calicular end, 5 mm.

Observations.—The species is much smaller than the preceding (*L. yeringæ*), and the corallum is more regularly cylindrical. The septa are less numerous.

L. parva seems to have its analogue in *Lindstroemia laevis*, Nich. and Eth. junr.⁷, of Upper Llandovery age, from Girvan, Scotland, but the latter is more turbinatæ.

Occurrence.—Silurian (Melbournian). In the grey mudstone of Yan Yean, G. S. V. coll., Bb 13; and in beds of similar age, in pale grey mudstone, Merri Creek, Kalkallo, sects. 2 and 3, G. S. V. coll., Bb 3.

5.—McCoy, 1850. Ann. and Mag. Nat. Hist., ser. 2, Vol. VI., p. 279, Idem, 1852, Pal. Foss., p. 40, pl. I., fig. 26.

6.—Silurian Fossils of the Girvan District, in Ayrshire, 1880, Vol. I., p. 86, woodcut on p. 84, fig. 4; pl. VI., figs. 2-2f.

7.—Sil. Foss. Girv. Distr., 1880, p. 90, pl. VI., figs. 4, 4e.

LINDSTROEMIA AMPLA, sp. nov.

(Pl. XI., Figs 4a-c; Pl. XV., Fig. 22.)

Description.—Corallum of fairly large size, short conical or turbinate, with a slight curvature. Major septa about 22 to 30, with short septa intercalated. When a wax squeeze is taken from the well-preserved casts, in which condition this coral often occurs, the septa are seen to be quite narrow to the base and their edges slightly spinulose. The columellar axis is seen as a large low mound extending over nearly the whole of the cavity. Where the septa meet in the centre, this species exhibits a marked polarity in the mesenteries, but not to so great an extent as in *Zaphrentis* and *Streptelasma*, and the shorter septa are twisted where they adjoin the cardinal and counter septa. Although the shape of the coral is turbinate and pointed, the cast, owing to the columellar mound, always appears truncated at the base, terminating in a sharp point.

A median vertical section of a paratype shows the calicular wall to be of moderate thickness (circ. 1.5 mm.); the base is filled to a height of 9 mm., with partially fused septa connected by irregular dissepiments. A transverse section across the top of the calice (rim) shows the septa there to be represented by mere spines projecting from a thickened epithecal base, and not longer than 2 mm. in length.

Dimensions.—Length of Holotype, 29.5 mm. Width at calicular opening, 22 mm. A gerontic form measures 46 mm. long and 39 mm. at opening of cup.

Occurrence.—Silurian (Yeringian). Holotype and others; Yering. Upper Yarra, G. S. V. coll., B23. Junction of Woori Yallock and Yarra, G. S. V. coll., B23. Griffith's Kiln, Mansfield, Vic., E. O. Thiele coll. Watson's Creek, G. S. V. coll., B22. Deep Creek, near Watson's Creek, G. S. V. coll. B20.

Silurian. Cemetery Hill Road, Whittlesea, W. J. Parr coll.

LINDSTROEMIA CONSPICUA, sp. nov.

(Pl. XII., Figs. 5-7, 8a, b; Pl. XV., Fig. 23.)

Description of Holotype (cast).—Corallum moderately large, regularly conical, rather short and broad. Principal septa about 25 at edge of corallum; about half the number at the base, where they are differentiated by two opposing septa, but not twisted to so marked an extent as in the preceding *L. ampla*.

A paratype from the same locality of South Yarra is partly in the form of a cast in fine siliceous mudstone, but retains a portion of the epithecal wall of the corallum near the outer rim. The basal portion shows 26 septa, which increase to twice the number at a later stage. The epithecal wall is finely granulate externally, and bears a definite sulcate ridge corresponding with the mesen-

tery beneath, now filled with matrix. The septa are shown as linear slits in the cast.

A wax squeeze of this paratype shows the base to be partially filled with a low mound of fused septa occupying about one-half the diameter of the cavity. The septa entirely down to the base are short and thin, and the arrangement of the septa indicates bilateral symmetry. The form of this paratype is broadly conical with the distal edge somewhat expanded.

Dimensions.—Length, 26 mm. Width, 23·5 mm.

Length of paratype, circ. 21 mm. Width of cup at base, 18·5 mm. Width of cup at base, from a squeeze, 12·5 mm. Diameter of columella, 6 mm.

Observations.—The number of septa in this species closely corresponds to that of *L. ampla*, but the shape of the corallum is quite distinct in being shorter and wider, and its conical form is more circular in section. In *L. ampla* the progressive growth is marked by an undulating epithelial wall, whilst in *L. conspicua* the wall is more regular and typically flat-surfaced.

Among British examples of what I conceive to be *Lindstroemia*, one may cite Phillips' Silurian form, "*Turbinolopsis elongata*"⁸ as related to *L. conspicua*, but it differs substantially in having a more lengthened corallum.

Occurrence.—Silurian (Melbournian); common in the white siliceous and black mudstones of South Yarra, coll. F. P. Spry. Also at Moonee Ponds Creek; J. F. Bailey, coll.

Silurian. Wandong, and Glenburnie Road, Whittlesea; J. T. Jutson coll.

LINDSTROEMIA SCALARIS, sp. nov.

(Plate XII., Figs. 9, 10.)

Description of Holotype (cast in ferruginous sandstone).—Corallum, elongate-conical, expanded at the mouth. Rejuvenescent periods strongly marked by the collar-like rim of successive cups, amounting to three in the present specimen. Septa of the adult form about 36.

General form closest to *L. ampla*, but with a large number of septa and strong growth stages.

A wax squeeze of the base shows the columella to be inconspicuous and the cavity deep.

Dimensions.—Length of corallum, 16·5 mm. Width of cup, circ. 12 mm.

Observations.—An example from Wandong shows about 40 septa, and the hollow mould indicates a coral with an attenuated base. The Camberwell specimen is shorter in its longer axis, but shows the same strong growth stages.

8.—*Turbinolopsis* sp., Lonsdale, Silurian System, 1839, p. 693, Pl. XVI. bis, Fig. 6. *Turbinolopsis elongata*, Phillips Palaeozoic Fossils of Cornwall, Devon and West Somerset, 1841, p. 6, Pl. II., Fig. 6B.

Occurrence.—Silurian. Glenburnie Road, Whittlesea; coll. J. T. Jutson. Wandong; coll. F. P. Spry.

Silurian (Melbournian). Hawthorn Brick Quarry, Camberwell; coll. R. H. Annear.

Fam. CYATHOPHYLLIDAE.

Genus *Cyathophyllum*, Goldfuss.

CYATHOPHYLLUM CRESSWELLI⁹, sp. nov.

(Plate XIII., Figs. 11-14.)

Description.—Corallum large, simple in habit, of erect growth; in form cylindrical with parallel sides, tapering at the base. Calyx deep; septa numerous, about 72 in three cycles. A cardinal and counter septum are seen in one example (a paratype, transverse section), extending almost across the thecal cavity. Septa slightly undulose, thinning out towards the centre of the cup, with twisted ends. Dissepiments abundant in outer zone, obliquely set in herring-bone fashion, but sometimes curved. Tabulae of central area short, discontinuous, and breaking up the septal plates into more or less cubical areas. Dissepiments of outer zone, as seen in vertical section of corallum, somewhat curved or vesicular. Epithecal walls not thick, somewhat wrinkled.

Juvenile examples are common which measure about 1 inch or more in length and are consequently not cylindrical, but turbinoid.

Dimensions.—Type (vertically sliced co-types); length (probably incomplete), 66 mm.; diameter of calice, 29 mm.

Length of Paratype (incomplete), 76 mm.; diameter at either end, circ. 34 mm.

Observations.—This striking coral cannot be confused with a similarly large Silurian form from Victoria and New South Wales, viz., *C. shearsbii*, Süssmilch¹⁰ on account of its cylindrical habit of growth. In *C. shearsbii* the corallum is distinctly turbinate, and is strongly curved in the earlier part of the corallum; the epithecal wall is thicker and more rugose, and the dissepiments of the outer zone are distinctly convex, instead of straight or oblique.

In its cylindrical character the present species, *C. cresswelli*, resembles the English Silurian (Wenlock Shale) species, *C. angustum*, Lonsdale¹¹, from Lickey, in Worcestershire, as also in its numerous septa and short tabulae; but differs in the more restricted dissepimental outer zone.

9.—Named in recognition of the late Rev. A. W. Cresswell's enthusiastic collecting in the early history of the Lilydale Quarry.

10.—*Cyathophyllum shearsbii*, Etheridge, junr., MS., Rec. Austr. Mus., Vol. V., Pt. 5, 1904, p. 288 (footnote). Süssmilch, Geol. N.S. Wales, 1904, figure only, Fig. 14B, facing p. 44. Chapman, Rec. Geol. Surv. Vict. Vol. LV., Pt. 2, 1920, p. 183, Pl. XVIII., Fig. 7; Pl. XIX., Fig. 9.

11.—Lonsdale, in Murchison's Silurian System, 1839, p. 690, Pl. XVI., Fig. 9.

In external appearance *C. cresswelli* recalls Röminger's Silurian species, *C. houghtoni*¹², but is easily distinguished by its dissepimental tissue in the outer septal zone.

Occurrence.—Silurian (Yeringian). Cave Hill, Lilydale, Victoria. Holotype and a paratype collected by the Rev. A. W. Cresswell, M.A. Paratype (juvenile example) presented by R. H. Annear, Esq.

CYATHOPHYLLUM SUBCAESPITOSUM, sp. nov.

(Plate XIII., Figs. 15, 16a, b.)

Description.—Corallum compound or aggregated; corallites more or less crowded, sometimes impinging on one another, when they become irregularly polygonal, forming a loosely bundled mass. Corallites of medium size, circular, elliptical or subpolygonal, with thin epithecal wall. Septa about 60, almost meeting at the centre. Primary cycle of septa with blunt or thickened ends, the secondary and tertiary ones correspondingly much shorter and thinned at the extremities. Outer zone of dissepiments extending to about one-half the diameter of the corallites, densely crowded and distinctly marked off from the inner zone. Basal sections of the corallites show definite pali to be there developed, and a directive septum extends across the corallite.

Dimensions.—Type specimen of fasciculated corallites, 85 mm. across. Average diameter of corallites, 12 mm. Height of type specimen, showing incomplete length of corallites, 52 mm.

Observations.—This species is clearly related to the well-known Devonian coral, *Cyathophyllum caespitosum*, Goldfuss,¹³ of Devonshire and the Eifel. It differs in the more numerous septation; in the denser outer dissepimental zone; and in the more general contiguity of the corallites. The respective diameters are very similar.

Occurrence.—Silurian (Yeringian). Cave Hill, Lilydale, Victoria. Presented by the Rev. A. W. Cresswell, M.A., 6.02.

Genus *Spongophyllum*, Edwards and Haime.

The corals ascribed to this genus are practically confined to the Devonian rocks in other parts of the world.

In *Spongophyllum* the corallum is massive, compound and the corallites prismatic. The latter are united by their external walls. Internal walls and columella absent. Septa numerous, thin and merged into vesicular tissue, which is abundant. Centre of vesicular cavity tabulate.

12.—Geol. Surv. Michigan, Vol. III., Pt. II., Palaeozoic Corals, 1876, p. 104, Pl. XXXVI.

13.—Petrefacta Germaniae, Vol. I., 1826, p. 60, Pl. XIX, Fig. 2, Edwards and Haime, Mon. Pal. Soc., Vol. VII., 1853, p. 229, Pl. LL, Figs. 2, 2a, b. Milne Edwards, Histoire Naturelle des Corallifères, Paris, 1860, p. 382, No. 37.

SPONGOPHYLLUM STEVENSI, sp. nov.

(Plate XIV., Figs. 17a, b; Pl. XV., Figs. 24, 27.)

Description.—Corallum compound, massive, moderately large, mushroom-shaped or sub-flabellate. Corallites polygonal, chiefly hexagonal, occasionally pentagonal. Mural walls defined as a sharp, thin line. Septa numbering about 30, alternate in length; short, stout at base and sharply pointed, extending into the thecal cavity for about one-half the diameter to the centre. Central area divided by the dissepimental tissue of the vesicular growth. In longitudinal section the central cavity is seen to be feebly tabulate, otherwise occupied by vesicular dissepiments. Vertical sections tangential to the wall of the corallites show the rigid and straight septal bars, divided by very thin tabulae.

Dimensions.—Corallum (almost complete) measuring from point of attachment to outer growth zone, 16.5 cm. Greatest width, circ. 18.7 cm. Greatest depth at growing surface, 6.8 cm. Average diameter of corallites, 6 mm.

Observations.—The above species closely approaches *Spongophyllum sedgwicki*, Edwards and Haime¹⁴, of the Devonian of Torquay, England, in the general characters of the corallites, but shows the following differences:—

In *S. stevensi* the corallites are more regular in size.

They are slightly larger.

The septa are stouter basally.

Thecal wall thinner.

Vesicular tissue more irregular in horizontal section.

Tabulae less pronounced.

Occurrence.—A single corallum here described was found during a Melbourne University geological excursion (3/8/21), at Cave Hill, Lilydale, by Mr. L. E. Stevens, who has presented the larger portion to the National Museum.

Age.—Silurian (Yeringian).

SPONGOPHYLLUM SHEARSBII, sp. nov.

(Plate XIV., Figs. 18a, b; Pl. XV. Figs 25, 26.)

Description.—Corallum massive, astraefiform. Corallites polygonal, fairly uniform and mainly hexagonal. Thecal walls thinner than in the preceding species, but apparently less closely united, since the coral weathers into prismatic fragments, unlike *S. stevensi*. Septa about 20 to each corallite, alternately long and short, the larger ones extending nearly to the centre, the shorter being only one-sixth the length. Vesicular dissepiments are seen in horizontal section as straight or oblique, thin or wavy partitions, aggregated near the centre.

14.—Pal. Foss. des Terr. Pal., 1851, p. 425. Idem, Mon. Brit. Foss. Corals (Pal. Soc. Mon.), 1853, p. 242. Pl. LVI. Fig. 2, 2a-c.

Dimensions.—A large fragment of a corallum—Holotype— from which sections were cut, measures about 16 cm. in height.

The corallites averages 5 mm. in diameter.

Observations.—The above species is closely related to *Spongophyllum stevensi*, but certain differences exist which make it easily separable.

In *S. shearsbii*, as compared with *S. stevensi*, the septa are less numerous; the primary septa are larger; and the dissepiments are roughly zoned near the centre, as in Etheridge's *S. bipartita*.

S. shearsbii differs from *S. bipartita* (see *postea*), in having both primary and secondary septa; in the presence of a well-defined thecal wall; and in the definite attachment of the distal ends of the primary septa to the corallite wall.

In some respects it agrees with Foerste's *S. spongophylloides*,¹⁵ as in the presence of primary and secondary septa; but the latter are more numerous in *S. shearsbii* and the epithecal wall considerably thicker.

Occurrence.—In the Silurian of Hatton's Corner, Yass, New South Wales. Presented to the National Museum by A. J. Shearsby, F.R.M.S.

SPONGOPHYLLUM BIPARTITA, Etheridge fil. sp.

(?) *Lonsdaleia* (*Spongophyllum*) *bipartita*, R. Etheridge, junr., 1889, Records Geol. Surv. New South Wales, Vol. I., Pt. I., p. 22, Pl. III.

Observations.—In his paper "On the Occurrence of a Coral Intermediate in Structure between the Genera *Lonsdaleia* and *Spongophyllum*, in the Upper (?) Palaeozoic Rocks of New South Wales, the late Mr. Etheridge, junr., described in detail this well-known Australian Silurian Coral.

For a long time it seems to have been a matter of doubt as to the conspecific relationship of Foerste's *S. spongophylloides*¹⁵ with the above form, and whose description was published in the preceding year. Thus Dr. Foerste himself wrote to me in April, 1920, "I should very much like to learn what is the present standing of those species," enumerating several, remarking, "Is *Endophyllum spongophylloides* the same as *Lonsdaleia bipartita*?"

Although Foerste's species, "*Endophyllum*" *spongophylloides*, judging by his figures and descriptions, approaches very closely to Etheridge's *S. bipartita*, there are certain important differences which prevent the absorption of *S. bipartita* into *S. spongophylloides*. Foerste's description was not so detailed as could be wished, probably on account of sparse material, and differences

15.—*Endophyllum spongophylloides*, Foerste. Bull. Lab. Denison Univ. Vol. III., 1888, p. 131, Pl. XIII., Figs. 16, 17.

16.—*Vide supra*.

in both figures showing septation offer reasons against their correlation. In Foerste's paper his species is misspelled "*spongophylloides*" in the text, and "*Spongophylloides*" in the explanation to Plate XIII., but is noted lower on that page.

The following diagnoses taken from Foerste and Etheridge respectively, will show their close but not identical relationship.

	Foerste (<i>S. spongophylloides</i>)	Etheridge (<i>S. bipartita</i>)
Diam. of corallite	9 mm.	10 mm. (mean)
transverse outline	polygonal or hexagonal	polygonal (pentagonal, quadrangular or hexagonal)
"	thin walls	thin epitheca
"	vesicular tissue about the walls.	"vesicular outer zone"
"	inner "zone in which the vesicular tissue is combined with radiating lamellae"	"The septal . . . area of vertical lamellae is of medium size, the septa starting in an irregular and ill-defined manner, from the distal row of vesicular plates"
Septa	shown in Foerste's figure average 12	Septa 18 to 20
"	primary and secondary as seen in Pl. XIII., Fig. 16	"all primary"

In the above synopsis it will be seen that Foerste's enumeration of the septa does not agree with Etheridge's, in the former averaging 12 against 18 to 20 in the latter. This fact, taken in conjunction with the figure where Foerste shows the septa (lamellae) as of two orders, thus opposed to Etheridge's statement that they "are all primary," compels us to regard the two forms as distinct.

Occurrence.—Silurian. Hatton's Corner, Yass, New South Wales. Several examples collected and presented by A. J. Shearsby, F.R.M.S., and by W. S. Dun, F.G.S.

Genus *Columnaria*, Goldfuss.

COLUMNARIA FLEMINGTONENSIS, sp. nov.

(Plate XIV., Figs. 19*a*, *b* ; Pl. XV., Fig. 28.)

Description.—Holotype, in a ferruginous mudstone, preserved as a negative cast. Characters described from a wax squeeze. Corallum fairly large, a fragment only preserved, measuring 5.3 cm. × 3.3 cm.; consisting of polygonal corallites having an average diameter of 5 mm. Walls of corallites moderately thick, well defined. Septa regular, about 15 primary and the same number of secondary, the primary extending to the centre, but only occa-

sionally meeting to form a twisted false columella. Tabulae concave proximally.

Observations.—The above species is extremely interesting from the fact that it combines the characters of several already known forms. Thus it has the thick epithecal walls seen in *C. halli*, Nicholson¹⁷, but without the clear, non-septate calycinal cup; the long septa of *C. calicina*, Nicholson¹⁸, but more numerous than in that species; the strong corallite walls, as in *C. neminghensis*, Etheridge fil.¹⁹, but with more regular and numerous septa and smaller corallites. From *Loyolophyllum cresswelli*, Chapman sp.²⁰, previously described by the author as a subgenus of *Columnaria*, but which, as suggested by the late Robert Etheridge junr. is generically distinct, it differs in having no outer vesicular zone nor deep concave tabulae; whilst the corallites in the present species are nearly five times the diameter.

Occurrence.—Silurian (Melbournian). In the grey and brown ferruginous sandy mudstone of Moonee Ponds Creek, near Flemington, Victoria.

Coll. Geol. Surv. Victoria.

EXPLANATION TO PLATES.

PLATE XII.

- Fig. 1.—*a-f. Lindstroemia yeringae*, sp. nov.: *a*, Holotype, exterior showing striated epitheca; *b* and *c*, examples showing general external characters; *d*, example sliced vertically, showing floor of calice with upward growth of columellar partitions; *e*, Paratype, vertical section, showing septation with dissepiments; *f*, Paratype, exterior, showing growth stages.
Silurian (Yeringian). Yering, Upper Yarra. Geol. Surv. Vict. B 15. Nat. size.
- Fig. 2.—*Lindstroemia parva*, sp. nov. Exterior showing coarse epithecal striae. Silurian (Melbournian). Yan Yean, near Whittlesea. Geol. Surv. Vict. Bb 13. Holotype. ×2.

17.—*Columnaria alveolata*, J. Hall (non Goldfuss), 1847, Pal. New York, Vol. I., p. 47, Pl. XII., Figs. 1, 1a-c. *Columnaria* (?) *halli*, Nicholson, 1879, Palaeozoic Tabulate Corals, p. 200, Pl. X., Figs., 3, 3a. *Columnaria halli*, Nich., Lambe, 1901, Contrib. Canadian Palaeont., Vol. IV., Pt. II., p. 100, Pl. VI., Figs. 2, 2a.

18.—*Favistella calicina*, Nicholson, 1874, Rep. Brit. Assoc. Trans. of Sections, p. 89; Id., 1875, Palaeont. Ontario, p. 24, Figs. 9a, b. *Columnaria hertzeri*, Rominger, 1876, Geol. Surv. Michigan, Fossil Corals, p. 90.

Columnaria calcina, Nicholson, 1879, Palaeozoic Tabulate Corals, p. 197, Pl. X., Figs. 2, 2a. Lambe, 1901, Contrib. Canad. Palaeont., Vol. IV., Pt. II., p. 102, Pl. VI., Fig. 4.

19.—Rec. Austr. Mus., Vol. XII., 1918, p. 50, Pls. VIII., IX.

20.—*Columnaria* (*Loyolophyllum*) *cresswelli*, Chapman, 1914, Rec. Geol. Surv. Vict., Vol. III., Pt. 2, p. 306, Pl. LI., Figs. 15, 16; Pl. LII., Figs. 17, 18.

- Fig. 3.—*L. parva*, sp. nov. An immature form, showing coarsely striated surface. Silurian (Melbournian). Yan Yean, near Whittlesea. Geol. Surv. Vict. Bb 13. Paratype. $\times 2$.
- Fig. 4, *a-e*.—*Lindstroemia ampla*, sp. nov. *a*, Holotype, exterior of a well-developed example; *b*, Paratype, corallum of medium growth; *c*, Paratype, vertical section of corallum, show deep calyx and short, septate columella, the cup filled with crinoidal debris. Silurian (Yeringian). Yering, Upper Yarra. Geol. Surv. Vict. B 15. *a, b*, nat. size; *c*, $\times 2$.
- Fig. 5.—*Lindstroemia conspicua*, sp. nov. Cast in mudstone. Silurian (Melbournian). South Yarra. Holotype; coll. F. P. Spry. Circ. nat. size.
- Fig. 6.—*L. conspicua*, sp. nov. Cast of basal portion of corallum in mudstone. Silurian (Melbournian). South Yarra. Paratype; coll. F. P. Spry. Nat. size.
- Fig. 7.—*L. conspicua*, sp. nov. Cast in ferruginous mudstone, showing floor of calyx, with indications of septal polarity. Silurian (Melbournian). Moonee Ponds Creek. Paratype; coll. J. F. Bailey. Circ. nat. size.
- Fig. 8, *a, b*.—*L. conspicua*, sp. nov. *a*, Cast of floor of calyx in black mudstone; *b*, lateral view of cast of corallum. Silurian. Wandong, Vict. Paratype; coll. F. W. Rowe. Nat. size.
- Fig. 9.—*Lindstroemia scalaris*, sp. nov. Cast of corallum, showing conspicuous growth stages. Silurian. Glenburnie Road, Whittlesea. Holotype; coll. J. T. Jutson. Nat. size.
- Fig. 10.—*L. scalaris*, sp. nov. Cast of corallum, showing growth stages and coarse epithelial striae. Silurian (Melbournian). Hawthorn Brick Quarry, near Melbourne. Paratype; pres. R. H. Annear. Nat. size.

PLATE XIII.

- Fig. 11.—*Cyathophyllum cresswelli*, sp. nov. Holotype (one-half), vertical section, showing large central dissepimental area, with thin tabulae. Silurian (Yeringian). Cave Hill, Lilydale. Coll. Rev. A. W. Cresswell, M.A. Nat. size.
- Fig. 12.—*C. cresswelli*, sp. nov. Polished horizontal surface section, showing septal zone and calicinal cavity. Silurian (Yeringian). Cave Hill, Lilydale. Paratype. Coll. Rev. A. W. Cresswell, M.A. Nat. size.
- Fig. 13.—*C. cresswelli*, sp. nov. Horizontal section (thin slice), showing dissepiments of septal zone. Silurian (Yeringian). Cave Hill, Lilydale. Slice taken from the preceding specimen. Nat. size.
- Fig. 14.—*C. cresswelli*, sp. nov. Lateral aspect of an immature example. Silurian (Yeringian). Cave Hill, Lilydale. Paratype; pres. by R. H. Annear. Nat. size.

- Fig. 15.—*Cyathophyllum subcaespitosum*, sp. nov. Polished surface of corallum, showing fasciculated corallites in horizontal section. Silurian (Yeringian). Cave Hill, Lilydale. Holotype; pres. Rev. A. W. Cresswell, M.A. Nat. size.
- Fig. 16, *a, b*.—*C. subcaespitosum*, sp. nov. *a*, polished horizontal surface of a small specimen; *b*, same specimen in lateral aspect. Silurian (Yeringian). Cave Hill, Lilydale. Paratype. Coll. Rev. A. W. Cresswell, M.A. Nat. size.

PLATE XIV.

- Fig. 17 *a, b*.—*Spongophyllum stevensi*, sp. nov. *a*, horizontal section of corallum; *b*, longitudinal section of corallum. Silurian (Yeringian). Cave Hill, Lilydale. Slices (tectotypes), cut from holotype, pres. by L. E. Stevens. \times circ. 2.
- Fig. 18 *a, b*.—*Spongophyllum shearsbii*, sp. nov.; *a*, polished horizontal section of corallum; *b*, vertical section of corallum. Silurian. Hatton's Corner, Yass, N.S. Wales. Cotypes, pres. A. J. Shearsby, F.R.M.S. Nat. size.
- Fig. 19 *a, b*.—*Columnaria flemingtonensis*, sp. nov. *a*, Holotype (negative cast); *b*, wax squeeze, giving positive aspect. Silurian (Melbournian). Moonee Ponds Creek, Flemington. Geol. Surv. Coll. Nat. size.

PLATE XV.

- Fig. 20.—*Lindstroemia yeringae*, sp. nov. Section across summit of corallum, showing two cycles of septa. Silurian (Yeringian). Yering, Upper Yarra. Tectotype, G. S. V. B15. $\times 3$.
- Fig. 21.—*L. yeringae*, sp. nov. Section at about 6 mm. above base of corallum, showing primary septal cycle and central point of coalescence. Silurian (Yeringian). Yering, Upper Yarra. Tectotype. G. S. V. B15. $\times 3$.
- Fig. 22.—*Lindstroemia ampla*, sp. nov. The same example as in Fig. 4c. Drawing to show structure of floor of corallum, with coalescence of septa by dissepiments. $\times 2$.
- Fig. 23.—*Lindstroemia conspicua*, sp. nov. Wax impression of a cast of the floor of the calyx (see Fig. 8a), showing feeble, zaphrentoid structure. Silurian. Wandong. $\times 2$.
- Fig. 24.—*Spongophyllum stevensi*, sp. nov. Corallite enlarged. Transverse section. $\times 2$.
- Fig. 25.—*S. shearsbii*, sp. nov. Corallite enlarged. Transverse section. $\times 3$.
- Fig. 26.—*S. shearsbii*, sp. nov. Corallite in vertical section. $\times 2$.
- Fig. 27.—*S. stevensi*, sp. nov. Original contour of Holotype. One half diameter of specimen.
- Fig. 28.—*Columnaria flemingtonensis*, sp. nov. A calice from a wax impression. $\times 3$.